

California Environmental Protection Agency



Air Resources Board

Proposed Re-Adoption of the Low Carbon Fuel Standard

February 19, 2015

Overview of Presentation

- Background and Current Status
- Proposed Regulation
- Environmental and Economic Impacts
- Focus of 15-Day Changes
- Timeline

LCFS History

- Original adoption in 2009, amended in 2011
- Goal: Reduce carbon intensity (CI) of transportation fuel pool by at least 10% by 2020
- Expected benefits:
 - Complement other measures to reduce greenhouse gases (GHG) emissions to 1990 levels by 2020
 - Transform and diversify fuel pool and reduce petroleum dependency
 - Reduce emissions of other air pollutants

LCFS is Part of a Portfolio of GHG Policies

- Transportation sector responsible for:
 - 40% of GHG emissions
 - 80% NOx emissions
 - 95% PM emissions
- LCFS works with the following programs to reduce transportation GHG emissions:
 - Cap-and-Trade Program
 - Advanced Clean Car Program
 - SB 375
- Key program to achieve Governor's petroleum reduction goal by 2030

Others are Following California: Pacific Coast Collaborative Update



Toward an integrated West Coast market for low-carbon fuels

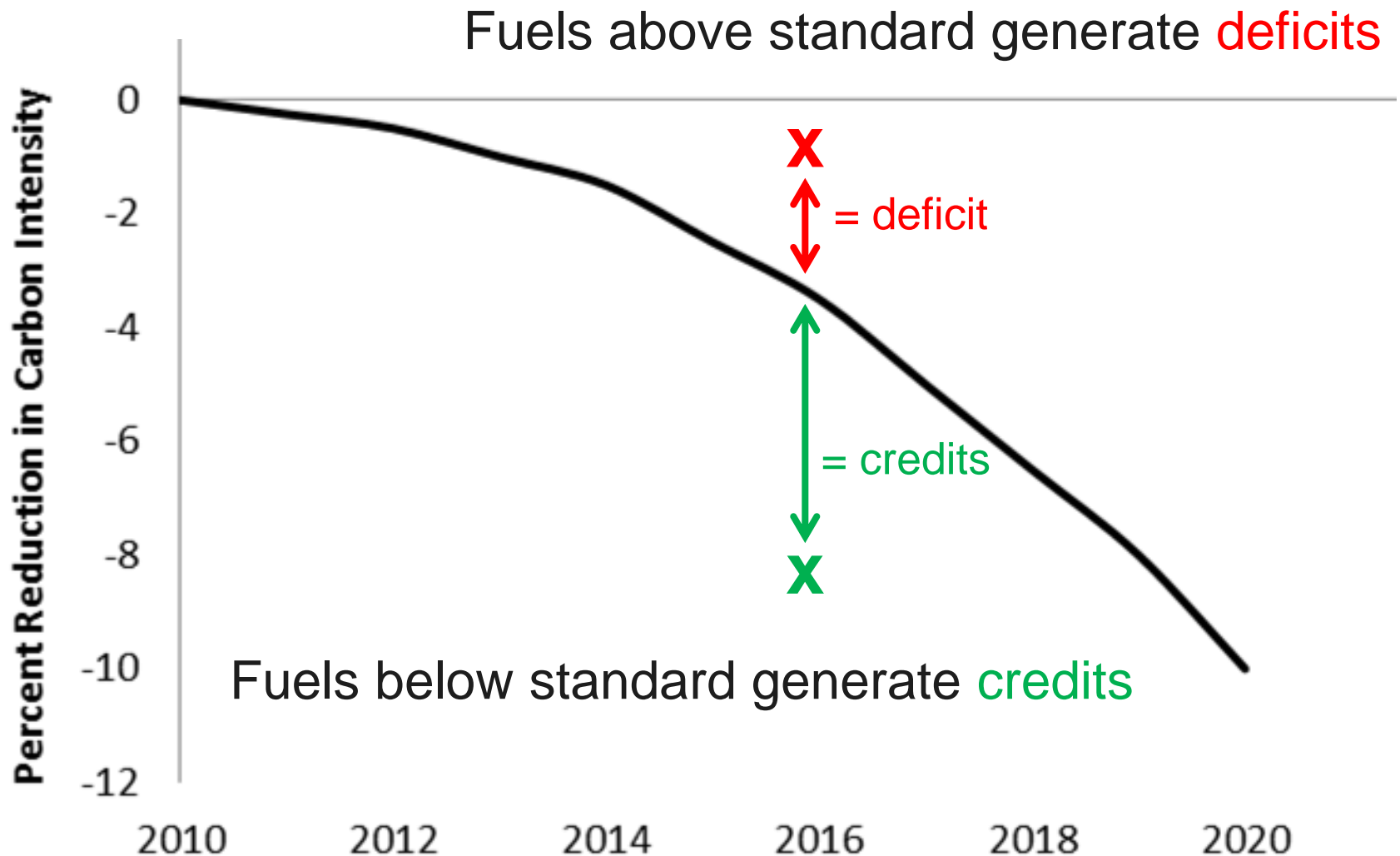
- **CA and BC:** Program in place
- **WA:** Gov. Inslee's EO 14-04
- **OR:** Legislation pending to remove 2015 sunset
- Recent ICCT research finds that the clean fuel goals of all jurisdictions achievable simultaneously¹

¹ <http://www.theicct.org/potential-low-carbon-fuel-supply-pacific-coast-region-north-america>

Basic LCFS Requirements

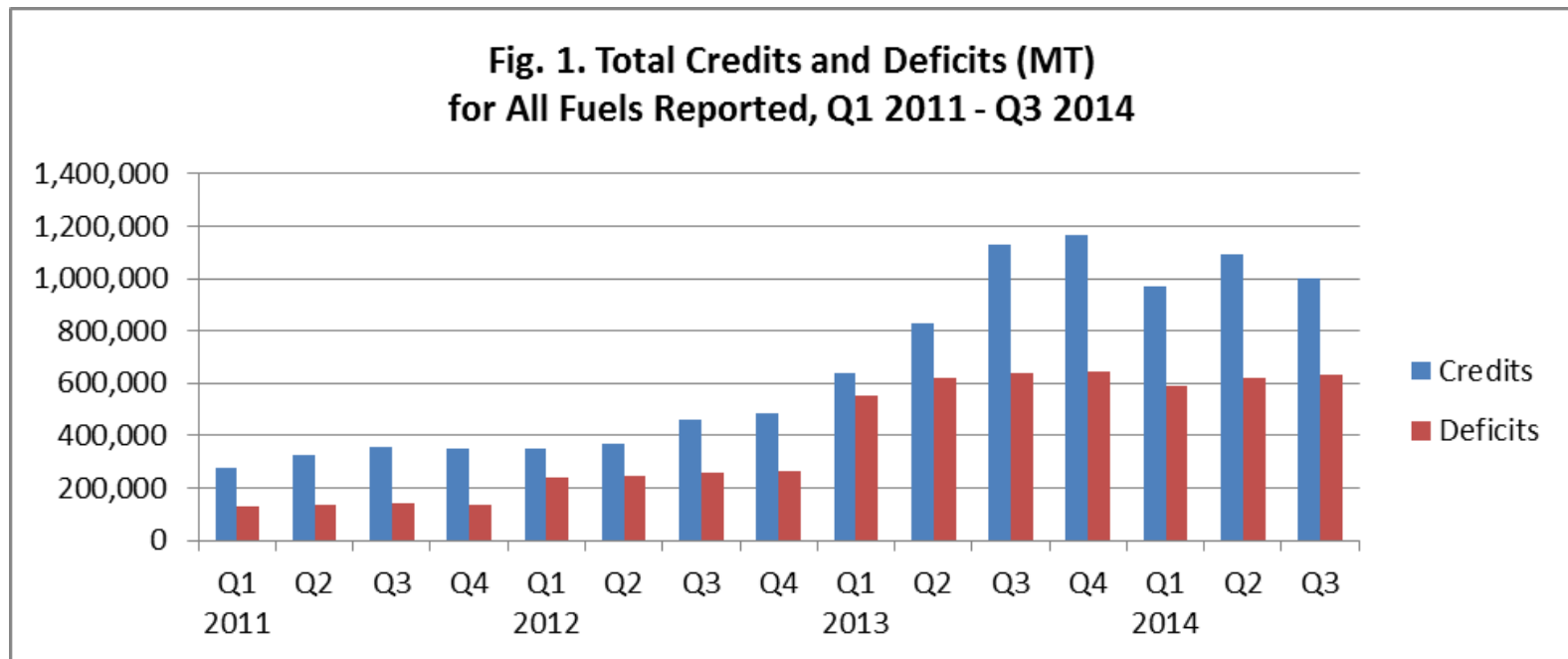
- Sets annual carbon intensity (CI) standards for gasoline, diesel, and the fuels that replace them
- CI is the measure of GHG emissions associated with producing and consuming a fuel, which is measured in grams of carbon dioxide equivalent per megajoule (gCO₂e/MJ)
- CI based on complete lifecycle analysis

Declining Carbon Intensity Curve: Concept

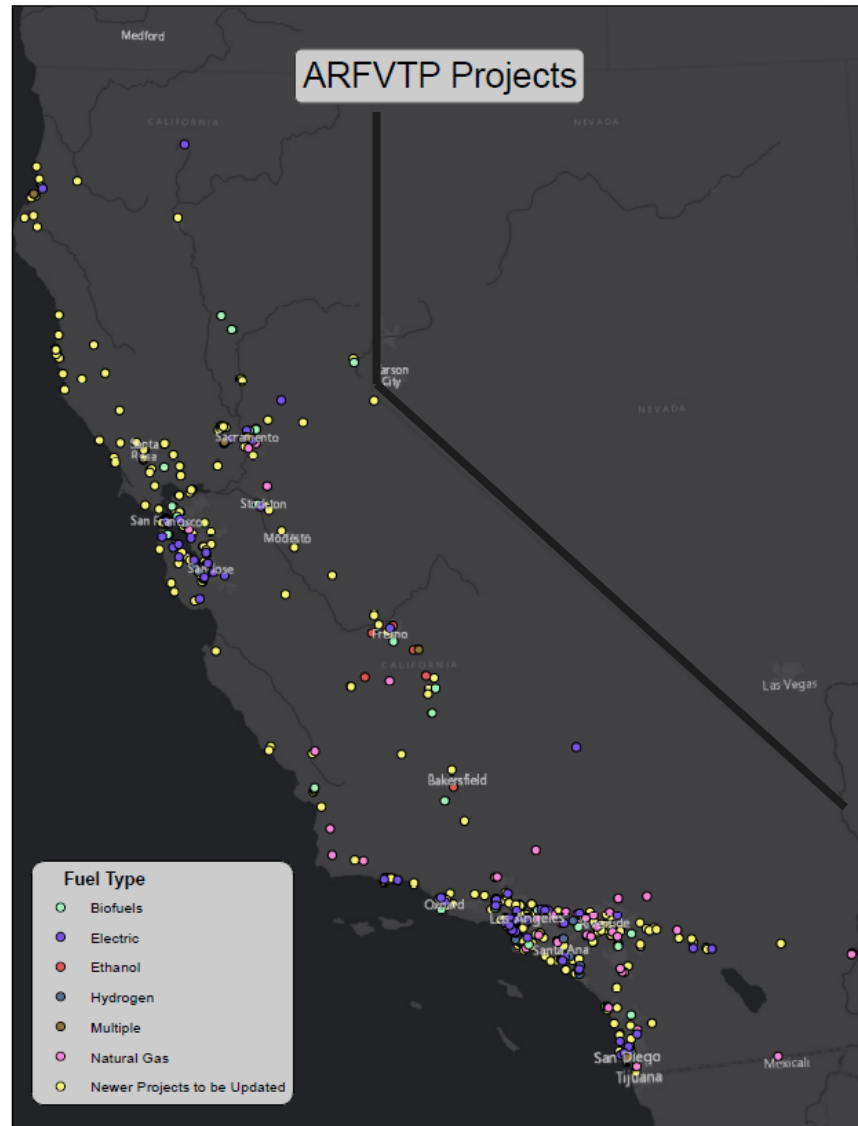


The California LCFS is Working

- Low carbon fuel use is increasing, crude CI remains stable
- Regulated parties are engaged in transactions in the credit market
- Credits have exceeded deficits in all quarters and a significant credit bank has been built

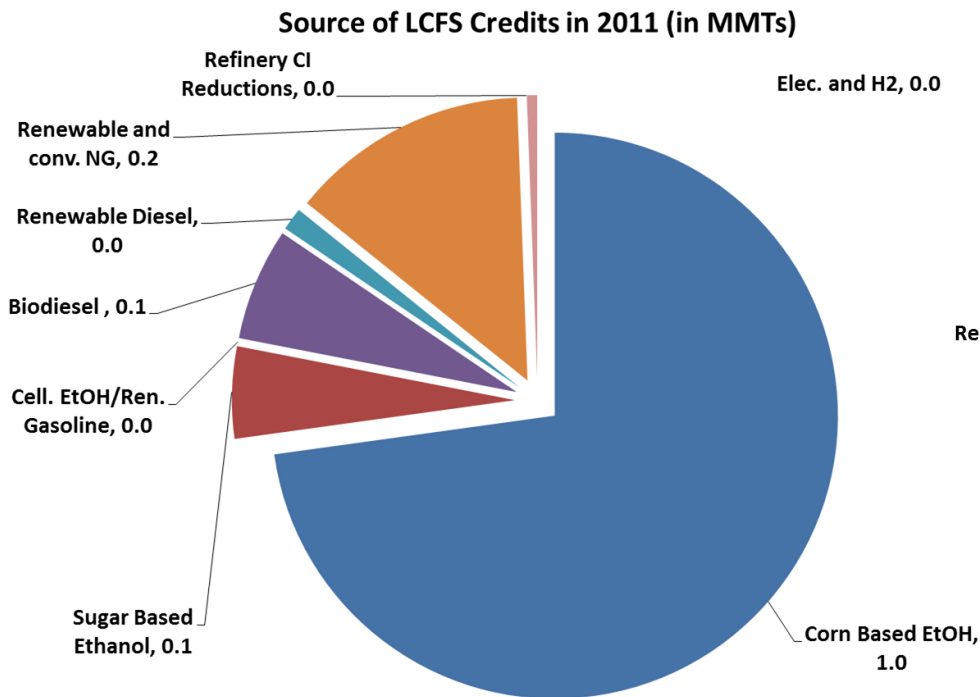


Growing Low Carbon Fuels Presence in California

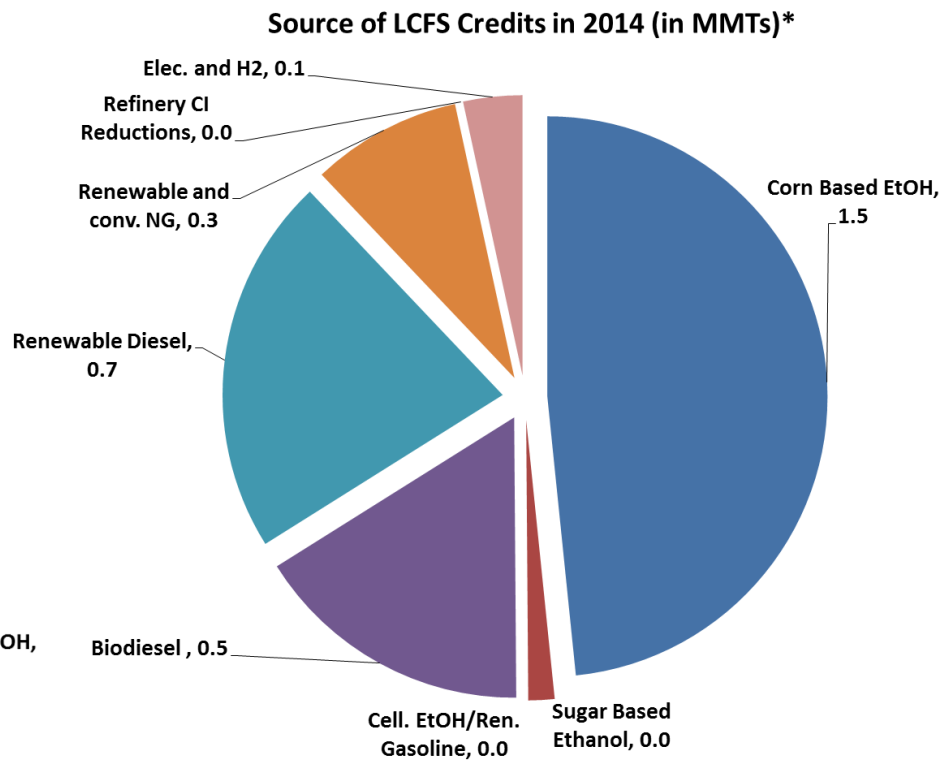


Fuel Diversity Increasing: 2011 vs. 2014

Total Number of Credits in 2011 =
1.31 MMT



Total Number of Credits in 2014 =
3.04 MMT



* Through first 3 Quarters of 2014

Legal Challenges Created Uncertainty for Low Carbon Fuel Investment

- **Federal: 9th Circuit Court of Appeals**
 - Rejected several constitutional claims
 - Ruled in favor of ARB
- **State: Court of Appeal**
 - Found procedural issues with CEQA and APA
 - Rejected plaintiff's request to strike down LCFS
 - Allowed ARB to enforce 1 percent reduction in CI from LCFS

Proposed Re-Adoption

Staff developed the proposed rulemaking package to:

- Address the court's concerns about the original biodiesel environmental analysis through the Alternative Diesel Fuel (ADF) rule and the new draft environmental analysis
- Clarify and enhance the regulation
- Incorporate Board's direction, stakeholder input, and lessons learned from five years of implementation
- Incorporate latest science and technical knowledge
- Provide greater certainty

Public Process

- Initiated re-adoption with March 2014 Concept Paper
- 5 overview workshops
- 15 topic-specific workshops
- External peer review of staff's methodology in calculating CI values
 - Peer review process will be completed before second Board Hearing
- 2 advisory panel meetings in 2014

Proposed Regulation

Summary of Re-Adoption



Core Concepts Remain Unchanged

- Use of lifecycle analysis including indirect land use change (ILUC) effects
- Declining carbon intensity (CI) targets through 2020
- Credit generation and trading
- Quarterly and annual reporting requirements

Key Areas of Proposed Improvement

- CI calculation tools updated using latest science
- 2016-2020 targets adjusted
- Adding additional cost containment
- Streamlining implementation

Proposed Compliance Curve Adjustments

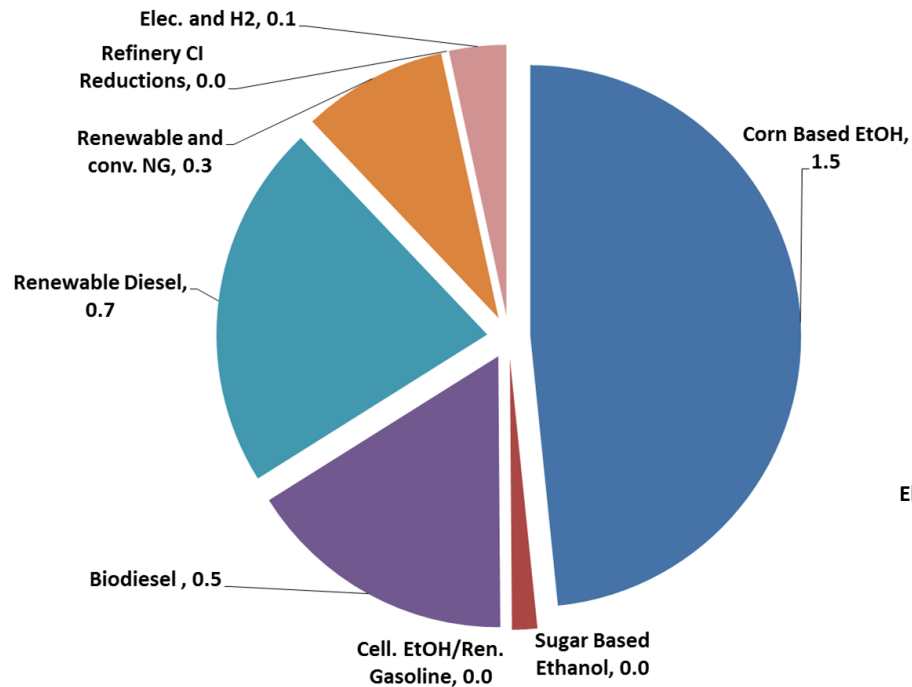
- Retain requirement to reduce average carbon intensity 10% by 2020
- Modify interim (2016-2019) requirements to address delayed investment due to legal challenges

Year	Current Reduction Percent	Proposed Reduction Percent
2016	3.5 percent	2.0 percent
2017	5.0 percent	3.5 percent
2018	6.5 percent	5.0 percent
2019	8.0 percent	7.5 percent
2020 onwards	10.0 percent	10.0 percent

Sources of Credits: 2014 vs. 2020 Illustrative Scenario

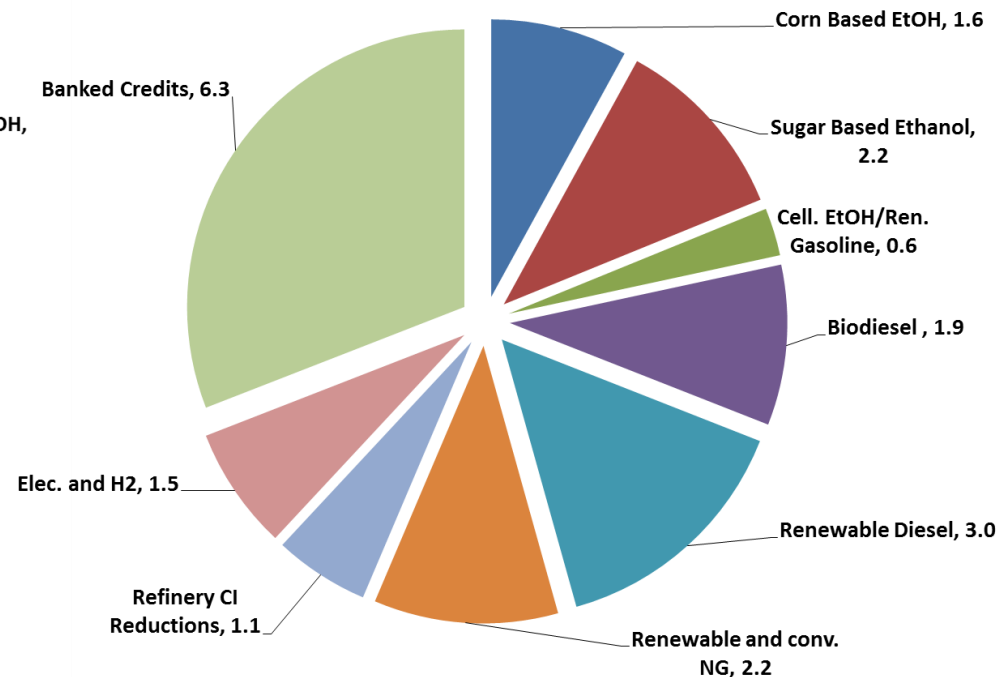
Total Number of Credits in 2014 =
3.04 MMT

Source of LCFS Credits in 2014 (in MMTs)*



Total Number of Credits in 2020 =
20.30 MMT

Source of LCFS Credits in 2020 (in MMTs)



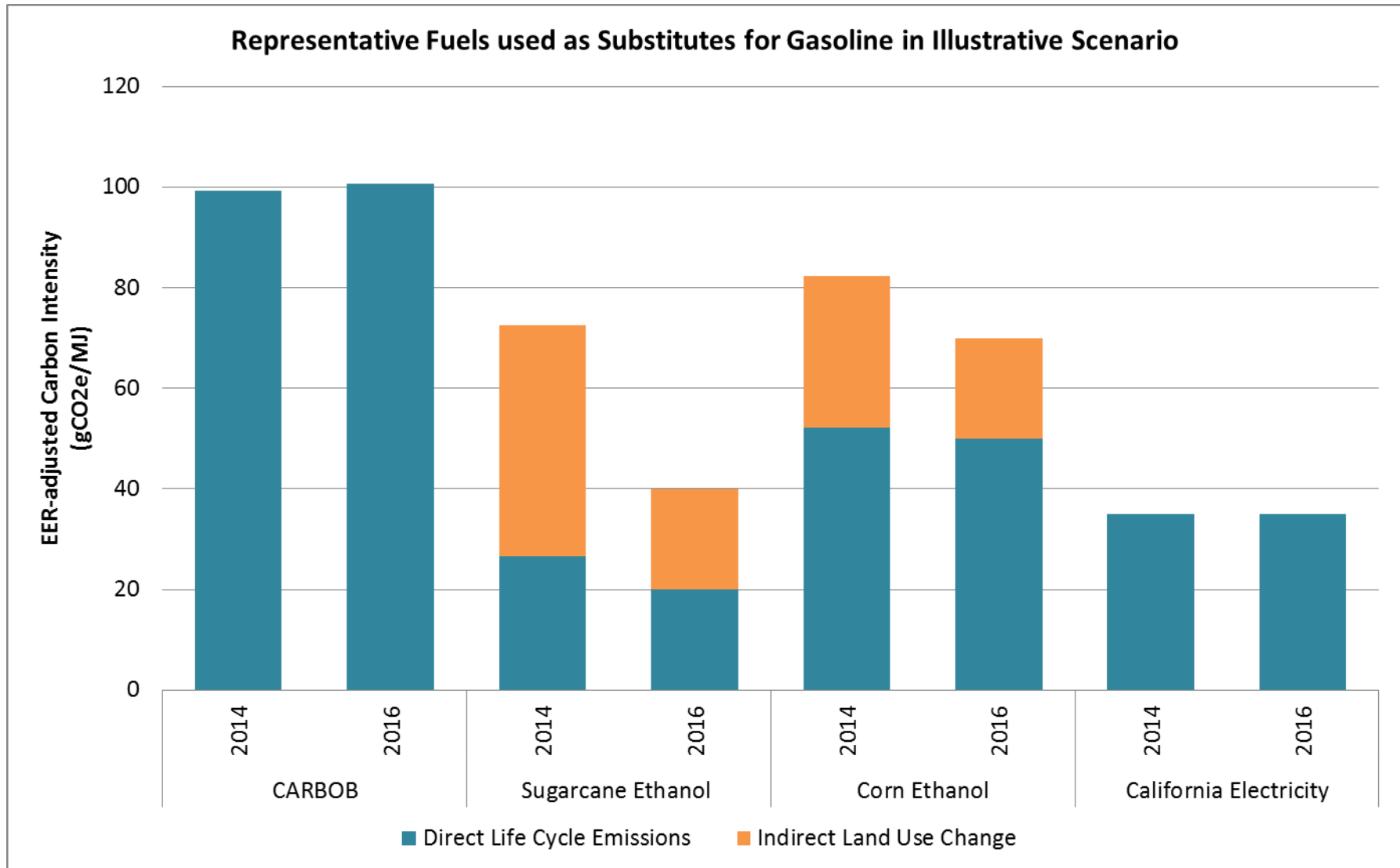
By 2020 we expect strong contributions from a balanced portfolio of low carbon fuels

* Through first 3 Quarters of 2014

Carbon Intensity: Improving the Science

- All tools were updated to provide an updated assessment of lifecycle CI for all fuels
- Direct CI tools
 - GREET: Direct carbon intensity of fuel production and use
 - OPGEE: Direct carbon intensity of crude production and transport to the refinery
- Indirect CI tools
 - GTAP: Indirect land use change
 - AEZ-EF (new): More accurately matches land conversions estimated by the GTAP model with corresponding carbon releases from soil and biomass

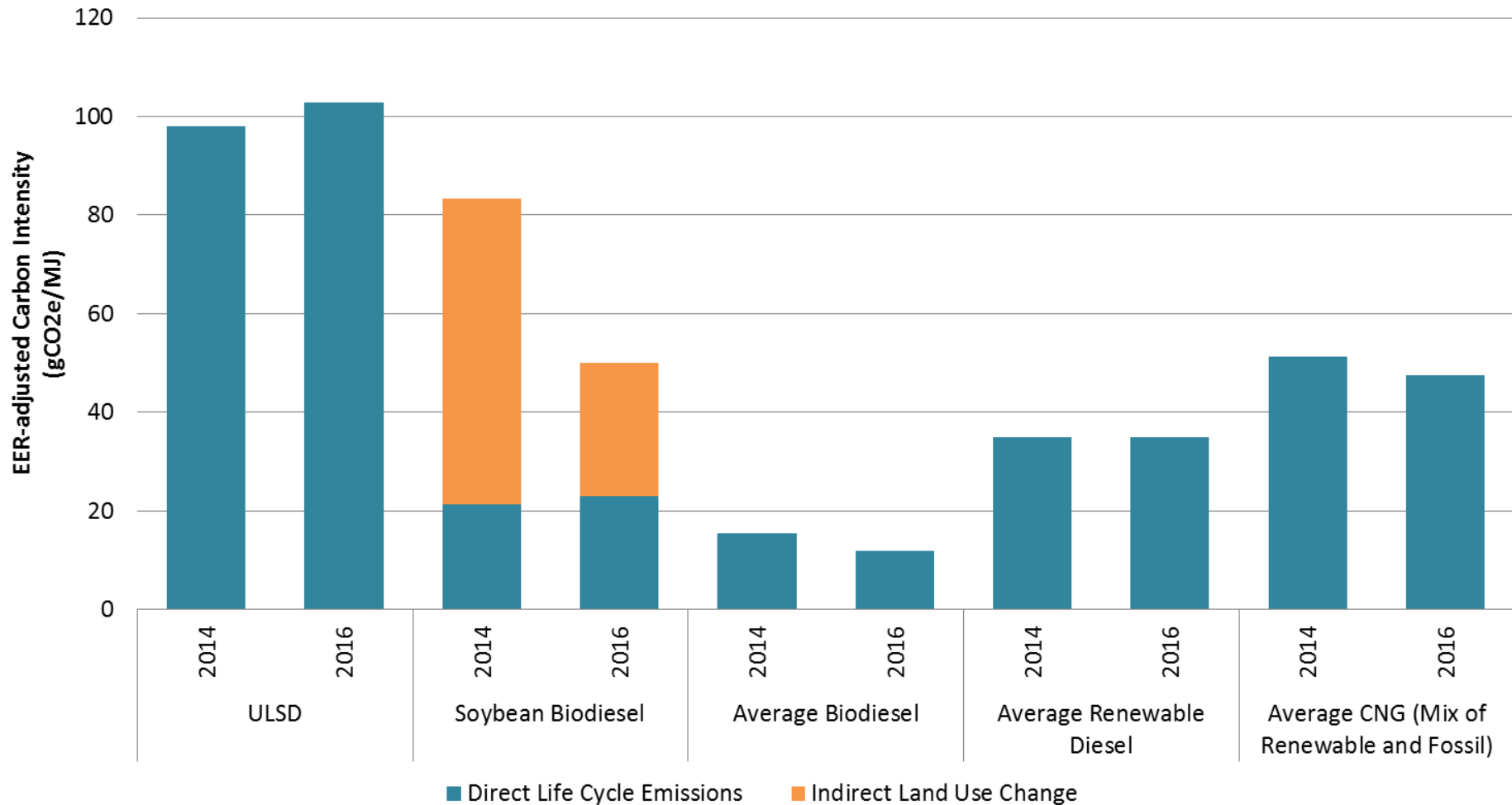
CI Values for Gasoline Substitutes



Values subject to update through the 15-day change process

CI Values for Diesel Substitutes

Representative Fuels used as Substitutes for Diesel in Illustrative Scenario



Values subject to update through the 15-day change process

Streamlining Fuel Pathway Process

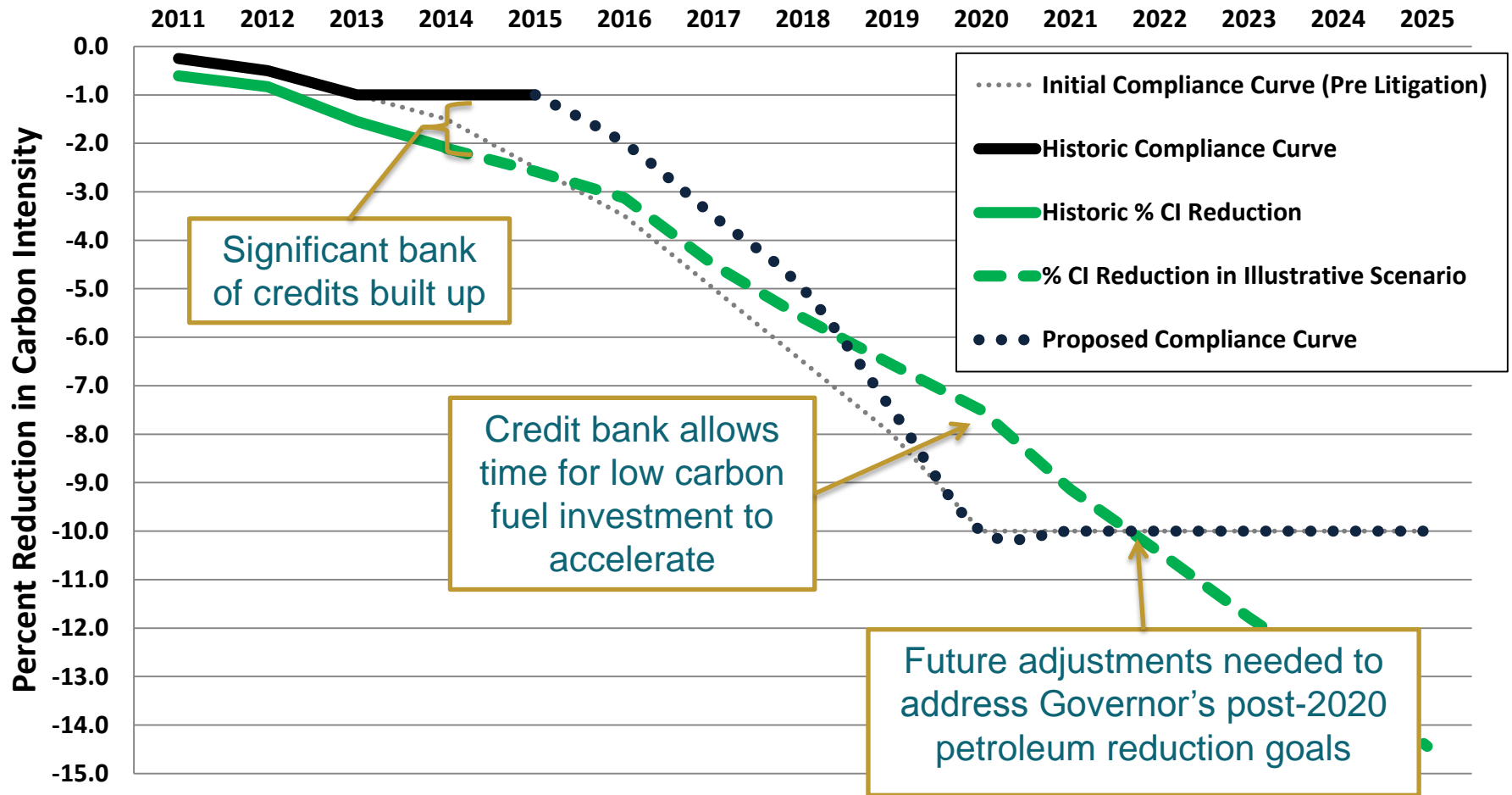
- 233 unique CI pathways currently available
- Pathway approval process is time and resource intensive
- Proposed fix: two-tiered system focused on next-generation fuels
- Conventionally produced first-generation fuels use a simplified GREET-based calculator
- Next-generation fuels select one of following methods:
 - Staff-developed reference pathways (lookup table)
 - Adjust existing pathway to create a new producer-specific pathway
 - Submit a novel producer-specific pathway

Current Cost Containment Features

- Credit Trading
 - 530 credit transactions from 2012 through November 2014
 - 2.7 MMT credits traded
- Credits fungible between gasoline and diesel pools
- No expiration of credits
- Voluntary Opt-In provision
- Carry-back provision
- Banking of Credits

Credit Banking Provides Flexibility

Existing vs. Proposed Standards and Annual Fuel Carbon Intensity



Example uses carbon Intensities based on composite of gasoline and diesel fuels

New Credit Clearance Market

- Year-End Credit Clearance Market will prevent price spikes in the unlikely case of credit shortages
- Defer deficits if pro-rata share of credits made available are purchased
- Price cap in 2016: \$200/MTCO₂e (adjusted for inflation in future years)
- Compliance debt carried over is assessed a 5% annual interest rate
- All deferred deficits must be repaid within 5 years

Credit for GHG Emissions Reductions at Refineries

- All refiners are eligible
- Projects must:
 - Result in CI reduction of 0.1 gCO₂e/MJ or more for CARBOB or CARB diesel
 - Involve capital investments or produce CARBOB/diesel fuel partially derived from renewable feedstocks
 - Apply for permit to construct in 2015 or later
- Projects cannot increase criteria or toxic emissions
- Examples: solar steam generation or biogas to hydrogen

Refinements to Support Innovative Technologies for Crude Oil Production

- CI credit for lower emission crude production for producers:
 - Must reduce annual emissions by more than 5,000 MTCO₂e or reduce CI by 0.1 g/MJ
- Simplified credit calculations for solar-based steam generation
- Added solar and wind electrical power generation and solar heat generation
- Treatment of carbon capture and sequestration aligned under LCFS and Cap & Trade

Low-Complexity/Low-Energy-Use Refinery

- A Low-Complexity/Low-Energy-Use refinery would be defined as having
 - A modified Nelson Complexity score of 5 or less
 - Annual energy usage of 5 million MMBtu or less
- Proposed treatment for a LC/LEU refinery:
 - Credit for refining-step CI (5 gCO₂e/MJ for both CARBOB and CARB Diesel)
 - One-time opportunity to have crude oil incremental deficit calculated on a refinery-specific basis

Refined Electricity Provisions

- Add electric transit systems and electric forklifts as eligible to generate credits
- Remove direct-metering requirement and allow estimation for electric vehicle charging
- Specific vehicle efficiency values for electric fixed guideway, buses, forklifts, and trucks

Enhanced Enforcement Provisions

- Jurisdiction clarified to include opt-in, registered brokers and entities applying for fuel pathway certification
- Clarified Executive Officer authority to suspend, revoke, or restrict an account when violations have occurred/being investigated
- Defined a “per-deficit” violation with a penalty up to \$1,000

Environmental and Economic Impacts

Environmental Analysis: Background

- One Draft Environmental Analysis was prepared for both Proposed LCFS & ADF Regulations.
- Existing regulatory and environmental setting in 2014 is used as baseline for the analysis.

Environmental Analysis Results: Benefits

Beneficial to greenhouse gases, air quality and energy

- Over 60 MMTCO₂e GHG emissions reductions from transportation fuels in CA from 2016 through 2020
- Reduce diesel related PM_{2.5} emissions from transportation fuels by about 1,200 tons from 2016 through 2020

Environmental Analysis Results: Impacts

- Potentially significant impacts to certain resources
 - Some related to long-term changes in fuel production and supply
 - Others shorter in duration related to construction of new facilities
- Significant cumulative impacts also identified for some resources

Economic Impacts: Background

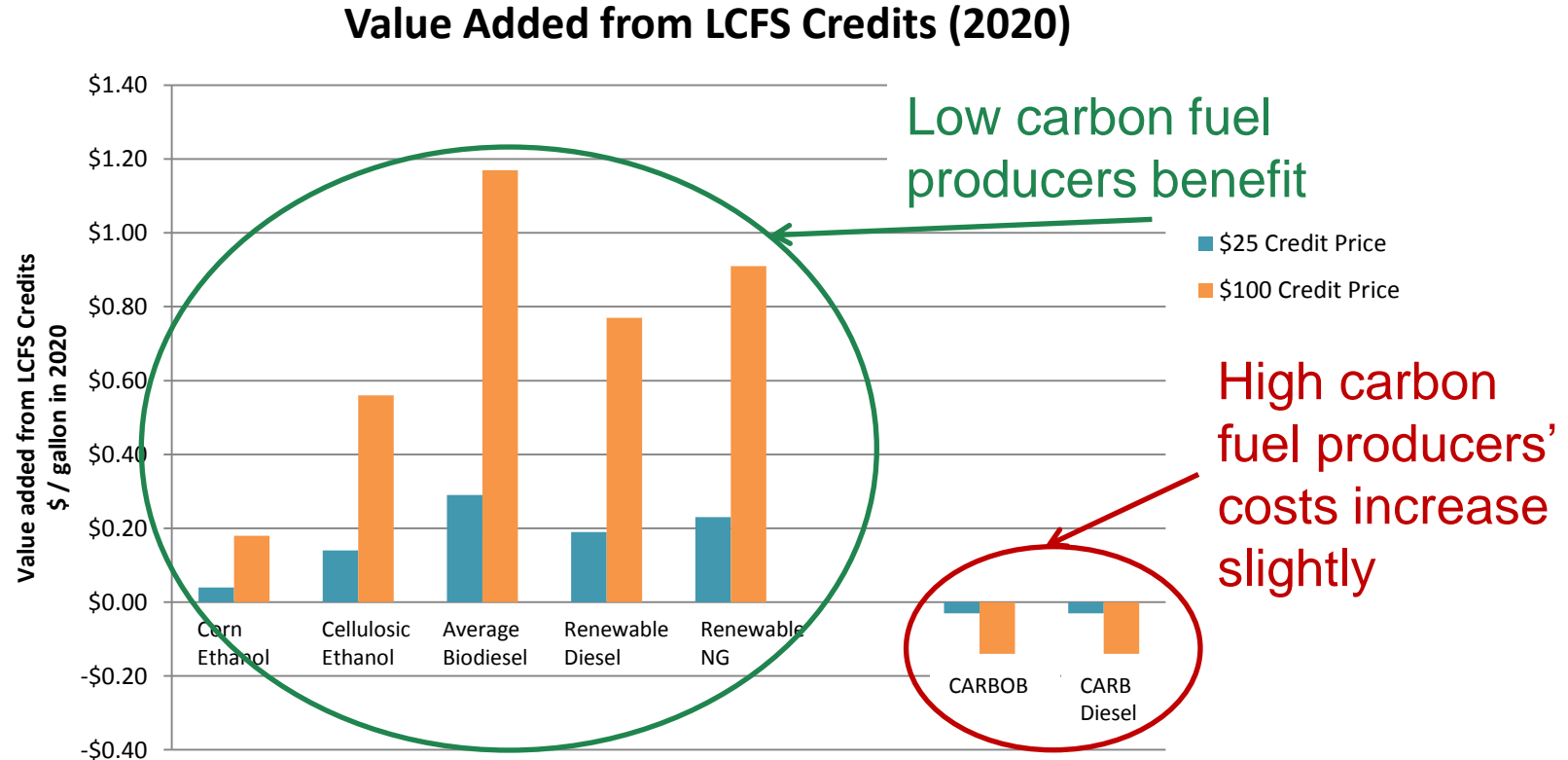
- Analysis jointly considered re-adoption of LCFS and adoption of ADF regulations
- Employed conservative framework:
 - Assumes all costs to the regulated parties are passed on to customers
 - Does not include climate protection benefits, health benefits, benefits due to reduced oil dependence
 - Does not account for interactions with other policies
 - Does not assume any reduced cost due to innovation

Economic Impacts: Macroeconomic Impacts

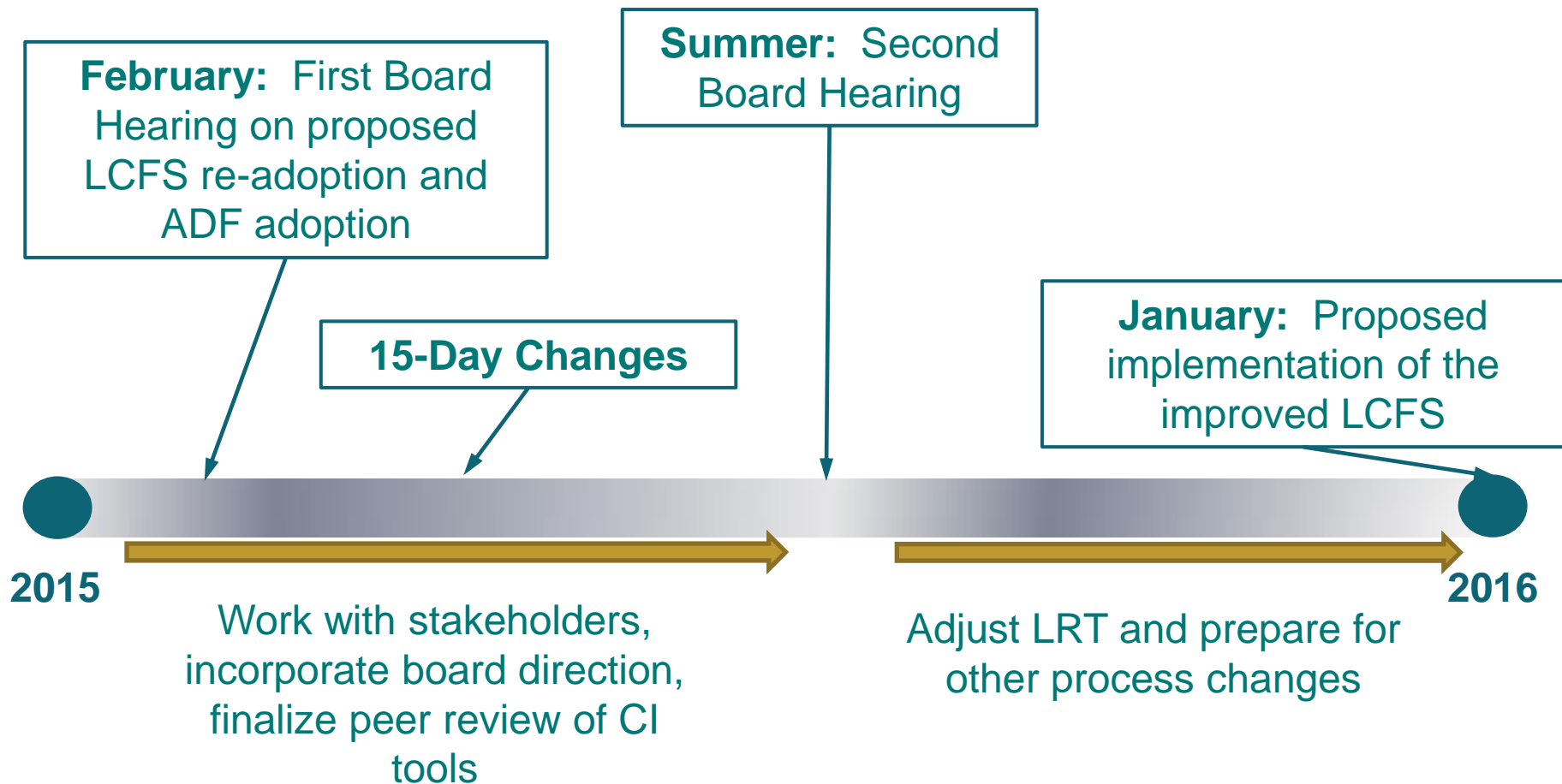
- Modeled using the Regional Economic Models, Inc. (REMI) tool
- Together LCFS and ADF:
 - Have a very small impact on CA's Gross State Product—reducing rate of increase by less than 0.06% annually
 - Have very small impacts on employment, reducing annual growth rates by less than 0.07%
- Under conservative assumptions, impacts are very small on California's large, diverse economy

Economic Impacts: Shift in Fuel Producer Costs

- LCFS credit value reduces the costs to producers of low carbon fuels
- Covering LCFS debits slightly increases the cost to producers of traditional fossil fuels



2015-2016 LCFS Timeline



Areas for Potential 15-Day Changes

- Finalize natural gas vehicle carbon intensity and other GREET model adjustments
- Clarify refinery investment provisions
- Direct inclusion of indirect land use change CI values in the regulation
- Revise the carry back credit provision
- Clarify timeline for evaluating pathway applications
- Revise the reporting parameters for electricity
- Schedule program review for 2017

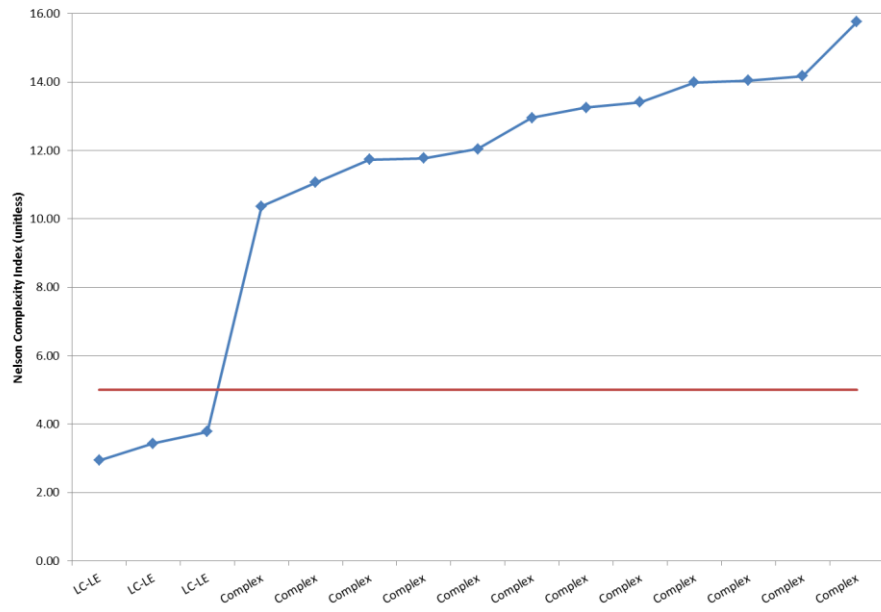
Next Steps

- Complete the environmental review process
 - Prepare written responses to environmental comments
 - Update the analysis, if needed
- Complete external peer review of CI tools
- Work with stakeholders on 15-Day Changes
- Return to the Board for consideration of rule adoption

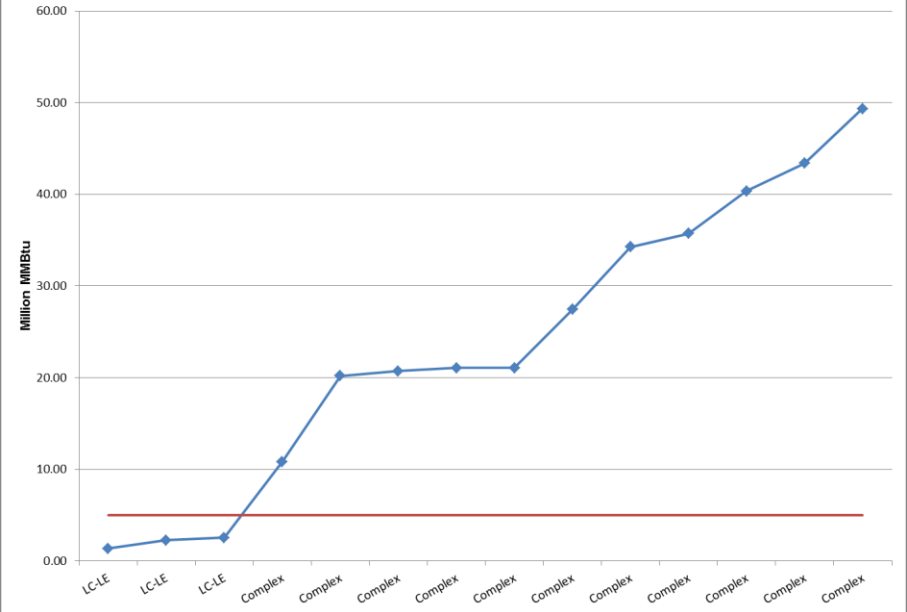
Background Slides

Low-Complexity/Low-Energy-Use Refinery

Modified Nelson Complexity Index



2011 - 2012 Average Energy Use



Modified Nelson Complexity: Less than or equal to 5

Total Annual Energy Use: Less than or equal to 5 million MMBtu per year